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ABSTRACT

With the passage of the Telecommunications Act of 1996, the pace of regulatory change related to telecommunications increased exponentially. The impact on rural areas is significant; the issues specific to southern states and communities are unique. This paper begins with a chapter on the importance of telecommunications technology to rural citizens, then provides a brief history of telecommunications regulation, from regulated monopoly to the increasing trend towards competition which is supported by the Act. A chapter on key elements of the Act covers definitions and principles of universal service, the role of information services, and implicit vs. explicit subsidies. Actions by the Federal-State Board on Universal Service include models for determining costs in rural areas, support mechanisms for low-income consumers and rural public and nonprofit health care providers, and discounts for schools and libraries based on economic conditions and rural/urban characteristics. Innovations in state telecommunications regulations and a summary of actions taken by southern states since the 1996 Act are also discussed. Key technology innovations that hold promise for rural areas and the importance of providing education and training on how and when to use them are described. The final chapter presents a checklist of items that state and local decision makers need to consider when defining telecommunications policy for their regions. (Contains 41 references.) (TD)

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The Telecommunications Act of 1996: Its Implementation in the U.S. South

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University of Nebraska-Lincoln

August 1999

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Introduction

With the passage of the Telecommunications Act of 1996, the pace of regulatory change increased exponentially. The impact on rural areas is significant; the issues specific to Southern states and communities are unique. This report provides a brief history of telecommunications regulation and an overview of the key elements of the Telecommunications Act of 1996. Innovations in state telecommunications regulations, as well as a summary of actions taken by Southern states since the 1996 Act was adopted, are discussed. After that whirlwind tour of telecommunications regulation, the report examines the evidence for the importance of telecommunications technology in rural areas and reviews key technology innovations that hold promise for rural areas. Finally, a checklist of items that state and local decision-makers need to consider when defining telecommunications policy for their regions is presented.

This report is intentionally brief; where appropriate, references to web sites or other resources are provided. In addition, a review of topics that have been addressed by public service commissions in Southern states reveals that different states have addressed various issues in unique ways.

The Importance of Telecommunications Technology to Rural Citizens

In the history of the human race, technological enhancements have brought changes in societies and communities. Today's telecommunications technologies have already changed rural communities across the nation, and these shifts should continue to spawn changes at an ever-increasing rate. Changes in rural communities associated with the use of telecommunications technology include:

- Work—The type of economic activities done in rural areas is shifting.
- Labor—The jobs evolving in rural areas are changing.
- Services—Social services as well as the government are using this new technology to centralize activities.
- Health Care—Telemedicine is providing a mechanism for sophisticated diagnostic work to be done over telephone lines.
- Education—Telecommunications technology is helping bring college courses and adult continuing education to rural places.

For this reason, it is critical that states and local communities consider the alternatives available to them when considering telecommunications policy issues.

Rural citizens view telecommunications technology as shaping the economic and social well being of where they live. In one study, researchers studying 20 rural communities found that 71 percent of respondents believed that telecommunications technology would enhance their community's economic competitiveness, and 67 percent thought that telecommunications technology would enhance their community's overall quality of life [20].

Table 1. Business Representatives' Opinions of Changes in Their Own Business in Recent Years Because of Telecommunications Technology, by Type of Business, 1994 (in percent).

Type of Business	Increased my business productivity+	Replaced a portion of my workforce++	Helped to expand my market++	Led to a reduction of my market	Reduced my transportation costs
Farm/Ranch	61	19	53	6	39
Retailing*	53	13	39	3	23
FIRE**	78	23	59	3	45
Services***	61	12	44	2	34
Health Services	60	10	39	–	23
Agricultural Services	66	26	58	3	36
Manufacturing	57	8	54	3	34
Construction	63	8	40	–	60
Other	64	16	58	–	31
All Business	61	15	47	2	33

* Includes eating and drinking establishments.
**Includes finance, insurance, and real estate.
***Does not include health services and agricultural services.
+Significantly different across type of business at the .05 level of significance based on Chi Square Test.
++Significantly different across type of business at the .01 level of significance based on Chi Square Test.

Source: Telecommunications and Rural Development Survey, 1994.

Economic Impact

Table 1 shows that rural business owners already are feeling the impact of telecommunications technologies. Of small town businesses in the Great Plains, 61 percent of the rural business owners/managers studied believed that telecommunications technologies had already increased their productivity, and 47 percent believed that it helped expand their markets [5]. The use of different types of technologies varied by type of business, and to some extent, the relative impact of telecommunications technology varied by business type, as well. For example, FIRE (finance, insurance and real estate), health services, and agricultural service businesses indicated relatively high use of computer modems, teleconferencing, and e-mail (Table 2). These uses of telecommunications technologies allow these rural businesses to overcome geographic isolation and often increase efficiency and participate in the global economy.

Regardless of the level of use, most businesses believed that telecommunications technology had in fact increased their business productivity and expanded their markets.

Social Impact

The adoption of telecommunications technologies also has impacts on social relations. In studies of small rural communities using electronic communication, the number of individuals who have external ties to the community has increased [2]. The characteristics of those using the new technologies provide insight into future trends. One major study found that the use of various telecommunications technologies varied by key socioeconomic and demographic factors [20]:

Table 2. Use of Telecommunications Technologies by Type of Business, 1994 (in percent).

	Type of Business								
Type of Technology	Farm/ Ranch	Retail*	FIRE**	Health Services	Agricultural Services	Service***	Manufacturing+	Construction	Other
Fax Machine	57	58	94	63	76	80	67	75	73
VCR Training Tapes	40	62	70	58	85	74	56	50	76
Telephone Answering	60	45	67	63	72	66	61	81	60
Computerized Accounting/ Billing	43	45	61	44	74	70	47	37	56
Cellular Phone	35	37	52	41	40	61	51	69	57
Computer Modem	19	36	65	35	61	56	47	21	49
Computerized Inventory System	27	35	33	26	36	63	39	21	46
"800" Number	32	32	38	26	27	49	44	27	47
Teleconferencing	14	18	49	31	45	41	28	13	38
E-mail	8	11	41	16	19	28	25	--	31
Telemarketing Service	11	18	28	14	9	22	25	19	29
Computerized Product Design	13	11	23	16	6	22	25	19	29
Internet	--	6	5	6	5	4	8	4	15

* Includes eating and drinking establishments.
**Includes finance, insurance, and real estate.
***Does not include health services and agricultural services.
+Durable and non-durable manufacturing.

Source: Telecommunications and Rural Development Survey, 1994.

- Age—Younger respondents reported using telecommunications technologies more than older respondents did.
- Education—The more formal education people had, the more likely they were to use telecommunications technologies.
- Income—People with higher incomes reported using a wider variety of telecommunications technologies more frequently than those with lower incomes.

Community Types

The use of telecommunications technology is not linked only to an individual's attributes. The emphasis that a community places on using the new technologies plays a role as well. When residents and business representatives rated their own community's use of technology relative to similar communities, differences emerged.

Rural business owners classify communities in three basic categories:

- Innovative—Communities that have a high degree of use of telecommunications technologies across all community dimensions. These communities typically credit visionary community leaders and involved telecommunications providers for their innovative status.
- Transitional—Communities that use technologies in some, but not all or most, community dimensions. These communities may use advanced telecommunications in schools or health care facilities, or have one or two businesses that rely heavily on telecommunications, but use is not shared across the rest of the community.
- Traditional—Communities who perceive themselves as about average on most community dimensions. Significantly, these communities note that local telecommunications providers tend not to be involved in local economic development efforts.

This typology shows that rural residents see the active presence of a local telecommunications provider in community-specific economic development efforts as a critical element to the relative progress of the community. This would confirm the earlier work by Sawhney et al. suggesting that the local telecommunications provider has a symbiotic relationship with the local community and that both the provider and the community benefit from innovation [5].

The characteristics of communities influence how important telecommunications technology is to their current economic and social functioning and how they will respond differently to changes in telecommunications law.

Information vs. Communication

The impact of telecommunications technology is not always positive. A 1997 report conducted by researchers at Carnegie-Mellon University found that people using the Internet from home primarily used it for two purposes: communication with others via e-mail and for information or entertainment, generally obtained from the World Wide Web. The study chronicled the experiences of families who began using an Internet service (HomeNet) provided by the researchers. That study found that people who used e-mail more than others tended to have more consistent use of the Internet and used it more often [24].

E-mail is largely a low bandwidth use, while web use increasingly depends on higher-bandwidth connections. This distinction is important to rural communities. For example, if a community has only low bandwidth access to the "information highway," people in that community can use e-mail and to some extent they can be consumers of information, much like television viewers are. However, low-bandwidth access is insufficient to allow members of a community to be providers of information, just as only a few communities have broadband transmission capabilities.

HomeNet users also experienced difficulty mastering the technology, and many who were unable to do so themselves simply dropped out of the study. Better training and easier-to-use technology is recommended.

A follow-up longitudinal report on the same HomeNet study indicated that even though the Internet is used extensively for communication, increased use of the Internet is associated with less communication with household family members, a reduction in the size of one's social circle and increases in depression and loneliness [30].

Local Zoning Regulations

Community officials are facing a dilemma because of new technologies. Numerous challenges to local zoning regulations have come about because of the increased demand for satellite capabilities. The Telecommunications Act is clear that states and localities may not create barriers to competition and some regulations regarding placement of satellite dishes have been found to be anti-competitive. The FCC's rule-making regarding video programming indicates state and local regulations that impede the installation or use of antennas that receive broadcast signals are prohibited. However, as far as their state enabling legislation allows, localities do retain the authority to regulate these items for safety or historic preservation reasons [15].

Given the increased role that wireless and satellite communications technologies are likely to play in rural areas, this issue bears serious consideration. While many rural areas may not even have zoning regulations in place that would affect the placement of such satellites, those that do may experience challenges on the basis of the Act's pro-competition provisions. Telecommunications competition must be balanced, however, with quality-of-life issues for the citizens who are served by the new telecommunications players, and placement of these technologies is something that local leaders must consider.

Implications for Southern Rural States

Previous studies present compelling evidence of the importance telecommunications technology holds for rural citizens. The issues faced by Southern rural states are somewhat different than those found in the Northeast, Midwest or West, because of differences in age distribution, education levels and economic base. Nevertheless, the framework of communities as innovative, transitional, or traditional is useful for local and regional policymakers to develop their own vision for the future, and the corresponding level of telecommunication access needed to accomplish that vision.

At the state level, when responding to the Telecommunications Act of 1996, policies that support all three types of communities need to be developed. The challenge of developing policy that guarantees a minimum level of access for communities who choose to remain "traditional" and that also supports the advanced telecommunications needs of "transitional" or "innovative" communities will no doubt be great, but effectively doing so is crucial to the future of these rural areas.

The Pittsburgh HomeNet study results also suggest that training on how to use technology is essential, and that there can be negative consequences of using information technology, specifically the Internet, too much.

To understand the implications of changes in the telecommunications law, it is first necessary to examine the national discussion that led to deregulation of the telecommunications industry and the

basics of the changes in the law before describing how the U.S. South is implementing these new regulations.

While the intent of the Telecommunications Act of 1996 was to level the playing field for increased competition and private innovation, the telecommunications landscape is in constant flux. Rural customers have, as yet, been shielded from the repercussions of these changes; however, this will not remain the case for long.

How Americans receive, use, and have access to information through telecommunications changed dramatically February 8, 1996, when President Clinton signed the Telecommunications Act of 1996. This Act was the first rewrite of telecommunications legislation in 62 years and was designed to promote competition in telephone and cable services and partially deregulate much of the industry. "As expected, its enactment has unleashed a flurry of activity, including two Baby Bell mergers (SBS and Pacific Telesis and Bell Atlantic & NYNEX)" [8]. Considerable attention is also being focused on the impact that deregulation will have on high cost areas, including much of rural America.

The importance of telecommunications to business, education, health, and quality of life for rural residents has changed in the recent decades. In the early 1980s, futurists identified a new form of social and economic structure within the U.S. and the world: the "information age" [10, 13, 28]. This new information age had the potential to alleviate rurality as a barrier to job creation, creating an atmosphere where geographic location was no longer the key to economic development and participation in this new form of social and economic organization [3]. By the late 1980s and early 1990s, researchers were painting a less than optimistic picture of adoption and diffusion of telecommunications into rural areas.

A General Accounting Office study suggested that during a sluggish economy, rural telephone providers would not be investing heavily in advanced telecommunications technology [34]. Others continued to suggest that a competitive market system for such an important utility could be harmful for rural areas. Parker suggested that the process of adoption and diffusion of advanced telecommunication technology into rural areas would be slow, with many regions lacking resources to modernize [29]. This led to a flurry of research focused on the actual utilization of telecommunications technologies by rural residents and businesses. In 1994, researchers conducted a Great Plains study to examine the actual use of telecommunications technology by rural residents and rural businesses [20]. The results indicate that rural businesses rely heavily on telecommunications technology, and many believe that technology helps improve their productivity and expand their markets.

The Telecommunications Act of 1996 has the potential to have positive as well as negative consequences for rural citizens. A key aspect of the Act is the continued devolution of government where states will be the front line for implementing the Act as well as making sure that open competition does not greatly disadvantage specific populations, such as the rural residents, the poor, or the elderly.

In the *1998 Commission on the Future of the South*, the Southern Growth Policies Board characterizes the importance of telecommunication technology, in relationship to other issues faced by states and communities, in this manner:

> A single mother who lacks the skills to get a decent job tugs at our hearts in a way a personal computer or the Internet cannot; so does a high-school graduate whose stumbling efforts to read are painful evidence of limited opportunities ahead; or a hungry child. These people need a helping hand.
>
> To us, that's where technology comes in. The experience of 5,000 years shows that technology and compassion for people can go hand in hand. From the compass to the pump, to the locomotive and the tractor, to the microprocessor and the personal computer, technology has been the means by which greater numbers of people have come to eat better, enjoy better health, and live in better housing [38].

Particularly in rural areas, it is imperative that telecommunications policy be approached in partnership with other community and state objectives. Telecommunications technology offers rural areas new tools with which to face the new millennium with hope and optimism, something that is far too rare in many rural areas today.

Telecommunications Policy Overview

The Telecommunications Act of 1996 removes the statutory and court-ordered barriers to competition within the telecommunications industry, enabling regional companies, long-distance carriers, cable companies, and other firms to compete head-on for customers. In rural areas, however, competition is expected to be less intense. In theory, this could mean that the benefits of deregulation could eventually turn into handicaps for rural communities and citizens.

To better understand the framework in which this Act was adopted, it is useful to understand the history of telecommunication regulation and how that affects the national objective of universal access.

Regulated Monopoly

In the years after Alexander Graham Bell's patents on the telephone expired, competition in local telephone service was fierce. However, the various systems did not interconnect with each other, with the unhappy result that some businesses needed multiple telephones, one for each system.

The concept of universal service has its roots in network economics: each additional node on the network enhances the value of all other nodes, because each of them can reach a larger number of people.

"Indeed, the first users of telephones were limited to calling a very small number of people who also had phones.... Only when a sufficient number of households and businesses joined the telephone network did it provide convenience and value to the average consumer" [8].

Municipal and State Regulation

Municipalities granted telephone franchises, but as more and more independent telcos merged, it became more difficult to regulate them on a local basis, so states began to regulate the local telephone exchanges. Most states established public utility commissions (PUCs) for the following reasons:

- To ensure that telephone companies, as a "natural monopoly," would not overcharge customers;
- To ensure interconnections between competing networks that would reduce unnecessary duplication and maximize the value of the network to users; and
- To protect AT&T from competition in large urban markets.

Federal Regulation

AT&T had a competitive advantage over the other local telcos because it held the patents on long-distance interconnections, and before long, AT&T's acquisition strategy gave it clear monopoly status. In 1910, the Interstate Commerce Commission began to regulate the interstate portion of AT&T's business to ensure "just and reasonable" rates. The Telecommunications Act of 1934 established the Federal Communications Commission and transferred regulatory control of interstate telecommunications from the ICC to the FCC.

Divested Monopoly

Two antitrust suits brought by the Justice Department against AT&T shaped telecommunications policy through the early 1990s [8]. They were the 1956 Consent Decree and a 1982 Modified Judgment.

1956 Consent Decree

In a 1949 suit, settled in 1956, AT&T was charged with monopolizing telephone equipment business through its exclusive purchases from Western Electric. The settlement allowed AT&T to keep Western Electric but prohibited it from entering any markets other than regulated telecommunications.

1982 Modified Final Judgment

In 1974, AT&T was again charged with monopolizing telephone equipment business and long-distance business. In a consent decree issued in 1982, AT&T was again allowed to keep Western Electric and its long-lines divisions, but AT&T agreed to divest itself of its regional telephone operating companies. In addition, AT&T was permitted to enter other markets that had previously been forbidden to it under the 1956 consent decree.

In 1984, the regional operating companies were organized into seven regional Bell operating companies (RBOCs) and by order of the 1982 Modified Final Judgment were directed to install switches that would enable equal access to any long-distance carrier, thereby paving the way for long-distance carrier competition. While restrictions on AT&T's other markets were relaxed, the RBOCs themselves continued to be forbidden from entering competitive telecommunications markets.

The 1982 Modified Final Judgment also created the framework for today's dual-regulatory system where regulation of telecommunications technology is shared between federal and state governments.

Federal regulation via the Federal Communications Commission—applies to long-distance telephone companies (also called inter-exchange carriers) that serve local area transport areas (LATAs) in multiple states. This split responsibility creates some tension between the goals of each of these regulatory entities.

State regulation—via the public utility commissions—applies to the local telephone companies (also called local exchange carriers) serving the 164 LATAs that were established in 1984. States also may regulate regional companies serving multiple LATAs within the same state.

Regulated Competition

The Telecommunications Act of 1996 continues the trend toward increased competition begun in 1982. Section 253 provides for competition among local exchange carriers by establishing a "no barrier to entry" clause.

Key aspects of this enhanced competitive environment include:

- Universal service must be assured.
- Implicit subsidies must be made explicit.
- Interconnection agreements are required of the incumbent local exchange carriers before they are permitted to enter new markets, including long-distance.
- Long-distance carriers may enter local exchange markets.

The sharing of regulatory authority by the federal government and states provide for tensions. With a divested monopoly focus and the concept of regulated competition, both entities are struggling with how to maintain equal access while facilitating competition and the diffusion of sophisticated new technologies.

Key Issues for Rural Areas

Universal Service Definitions

One of the fundamental issues decision-makers need to consider in developing telecommunications rules is the concept of "universal service." As defined in the preamble to the original 1934 Act, universal service means "to make available so far as possible, to all people in the United States, a rapid, efficient, nationwide, and worldwide wire and radio communications service with adequate facilities at reasonable charge." In 1934, this definition of universal service applied to a regulated monopoly. Prior to that, universal service was the vision of AT&T, under considerably less regulation.

The 1996 Act directed the FCC to update the definition of universal service to reflect current technologies and to devise funding mechanisms that would support the competitive markets of the next century. To facilitate this process, the FCC appointed a Federal-State Joint Board to evaluate the relevant issues and make recommendations. See Appendix A for a list of members.

Basic Universal Service

In the Report and Order on Universal Service released by the FCC-appointed Federal-State Joint Board on May 7, 1997, "basic" telecommunications universal service was defined as follows:

> . . . single-party service; voice grade access to the public switched network; Dual Tone Multifrequency (DTMF) signaling or its functional equivalent; access to emergency services including, in some circumstances, access to 911 and Enhanced 911 (E911); access to operator services; access to inter-exchange service; access to directory assistance; and toll limitation services for qualifying low-income consumers [17].

The Joint Board received comments indicating that advanced technologies such as broadband wireless technology or packet-switched networks should be included in the definition of universal service. The commissioners deferred addressing these technologies as they relate to basic universal service.

To ensure universal service, the Universal Service Fund has been restructured to ensure that carriers who receive universal funds do indeed provide all the services deemed necessary for basic service. In addition, the order establishes criteria for telecommunications providers who are eligible to receive subsidies from the universal fund.

Advanced Universal Service

On August 6, 1998, the FCC announced the beginning of a six-month inquiry to determine whether advanced telecommunications services are being made available to all Americans on a reasonable and timely basis. As specified in Section 706 of the Telecommunications Act of 1996, if the FCC finds that advanced telecommunications services are not widely available, by law it must take immediate action to address the situation.

To comply with Section 706, state and community leaders were encouraged to provide input on the following issues, with the findings issued in its report regarding CC Docket # 98-146 on February 2, 1999:

- What constitutes advanced telecommunications capability? For the purpose of the FCC's report, "advanced telecommunications" is defined as broadband capability, and "broadband" is defined as supporting 200 kbps (about four times the speed of a 56 kbps modem using a standard analog telephone line), both from the provider to consumer and consumer to provider in the last mile. The FCC notes that this definition will no doubt change as technology changes.
- To what extent are advanced telecommunications capabilities being deployed? The Report finds that advanced telecommunications capabilities are being deployed, and that even in rural areas, broadband is becoming widely available through the implementation of technologies such as cable modems or digital subscriber lines (DSL). One study indicates that 95 percent of the population has access to one or more Internet providers with a local call. At the end of the second calendar year of deployment, broadband technologies are enjoying approximately a 4 percent residential

penetration rate. This is comparable to the telephone, color telephone and cellular telephone at similar stages of market development.

- What actions may be necessary to further encourage deployment? At this time, the FCC does not propose any actions to further encourage deployment. However, the report does identify three issues that the FCC will continue to monitor:
  - Access to broadband—Continued increases in the availability of broadband options, particularly for Internet access, is needed.
  - Multiple-dwelling unit—Many commentators noted difficulty providing broadband service to the "last 100 feet" of multiple dwelling units, due to various restrictions. Considering that 28 percent of all housing units are multiple dwelling units, this is a concern.
  - Internet peering—Some concern was expressed over Internet peering, "an arrangement in which two Internet backbone providers exchange traffic that originates from an end user connected to one of the providers and terminates with an end user connected to the other provider." The FCC at this time has chosen to refrain from additional regulation in this matter [20].

Now that this initial 30-month review is complete, the FCC will continue to review the status of advanced telecommunications on an annual basis. As comments are requested, it is important for state and local policymakers to provide their insight.

Principles of Universal Service

Section 254(b) of the Telecommunications Act of 1996 sets forth the principles that are to guide the commission in establishing policies for the preservation of universal service. These principles include:

- Quality services should be available at just, reasonable, and affordable rates.
- Access to advanced telecommunications and information services should be provided in all regions of the nation.
- Consumers in all regions of the nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications and information services, including inter-exchange services and advanced telecommunications and information services, that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas.
- All providers of telecommunications services should make an equitable and nondiscriminatory contribution to the preservation and advancement of universal service.
- There should be specific, predictable, and sufficient federal and state mechanisms to preserve and advance universal service.
- Elementary and secondary schools and classrooms, health care providers, and libraries should have access to advanced telecommunications services.

In addition to the principles specified in Section 254(b), the FCC added that "competitive neutrality" should be among the principles that guide the universal service support mechanisms and rules. Taken together, these principles are used as a guide to preserve and advance universal service while promoting the pro-competitive goals of the 1996 Act.

The Role of "Information Services"

The Joint Board commissioners differentiated between telecommunications services and information services in the May 7, 1997, order.

Telecommunications Services

Services and technologies that are typically associated with transmitting a "clear" or unchanged signal from the point of origin to the point of termination are known as telecommunications services. In general, radio and television broadband service, as well as service that relies on the public-switched network, are considered telecommunications services, and these services have traditionally been regulated by the FCC.

Information Services

Information services, on the other hand, include additional technology that modifies the signal in some way. In general, digital packet-switched networks are considered information services, and again in general, the FCC has not regulated these networks. Considerable weight has been given to the pro-competition aspects of the Telecommunications Act of 1996; with that in mind, the FCC has chosen to proceed cautiously with regard to implementing new regulations.

Implicit vs. Explicit Subsidies

Prior to the implementation of the Telecommunications Act of 1996, universal service was achieved largely through implicit subsidies, mostly at the state level, but also at the federal level. The effect of these implicit subsidies has been to shift costs from rural to urban areas, from residential to business customers, and from local to long distance service.

Implicit Subsidies

Three types of implicit subsidies are currently in place. First, state requirements that local telephone rates be averaged across the state mean that high-density (urban) areas, where costs are typically lower, subsidize low-density (rural) areas. Also, most states have established local rate levels such that businesses pay more on a per-line basis for basic local service than do residential customers, although the costs of providing business and residential lines are approximately the same. In addition, rates charged for vertical services such as touch-tone, conference calling, and speed dialing subsidize basic local service rates. Finally, interstate and intrastate access charges are set relatively high in order to cover certain loop costs not recovered through local rates. These usage-based charges are then recovered through higher usage charges for interstate long distance service.

Of the three implicit subsidy mechanisms—geographic rate averaging, subsidizing residential lines via business lines, and interstate access charges—only the interstate access charge system has been regulated by the commission, and this contributes the smallest subsidy of the three.

Explicit Subsidies

To implement Section 254(e) of the 1996 Act, the FCC's task was to create a coordinated federal-state scheme to move from an implicit subsidy system to a set of explicit subsidies that would achieve

universal service goals. By making subsidies explicit, Section 253 on competitiveness also is supported. With the May 7, 1997, order, the commission took the first step toward making the access charge subsidy more explicit. Specifically, it established a timetable to identify implicit subsidies within the interstate and intrastate Universal Service Fund by May 1998.

State Responsibilities

As in the 1934 Act, states retain responsibility for setting local rates and assuring affordable residential rates consistent with Sections 254(f) and 253 of the Communications Act. States, then, are responsible for identifying any implicit intrastate subsidies that may presently exist and take appropriate action to convert those implicit subsidies to explicit ones. Several states have already done so, notably Virginia, Texas, and Arkansas. As more states continue to do so, the FCC will be able to assess whether additional federal universal service support is necessary to ensure that quality services remain "available at just, reasonable and affordable rates."

Federal universal service support is distributed based on the interstate portion of the difference between the forward-looking economic cost of providing service and a nationwide revenue benchmark. In general, federal universal service support is expected to continue to provide 25 percent of local telephone network costs, roughly the same percentage as the interstate rates provided before the May 7, 1997, Universal Service Order.

Federal-State Board on Universal Service

The 1996 Act directed the FCC to update the definition of universal service to reflect current technologies. To facilitate this process, the FCC appointed a federal-state joint board to evaluate the relevant issues and made a number of recommendations.

Rural, Insular, and High-Cost Areas

The Joint Board considered several models for analyzing costs in high-cost, rural, and insular areas. Several different methods were proposed by states who chose to comment on the high-cost issue, and the Joint Board recommended that a methodology based on forward-looking economic cost be used to calculate the cost of providing universal service for high cost areas because it best reflects the cost of providing service in a competitive market for local exchange telephone service, using current technologies.

Section 254(b)(5) of the Act states that the federal cost support mechanism "should be specific, predictable and sufficient." However, the models available to the FCC were unsuitable for use in these respects. Since the initial Joint Board order, two engineering process models have been proposed, each with their own strengths and weaknesses. Both models take costs based on the locations of customers and the costs of various parts of the network into account. In general, the Benchmark Cost Proxy Model (BCPM) attempts to provide a "real-world" view of the costs and revenues associated with providing universal service using the existing telecommunications network; the Hatfield model provides a more

scalable view using hypothetical locations of customers and a hypothetical telecommunications network model. Despite their differences, they can, in some cases, yield similar results.

Benchmark Cost Proxy Model (BCPM)

The BCPM model, developed by BellCore and typically the one proposed by incumbent local exchange carriers, first identifies "microgrids" that are served by existing wire centers. The microgrids are compared with census block groups (CBGs), and if there are multiple microgrids within a census block group, locations of customers are interpreted to be distributed not along the edge of the CBG or microgrid but along roadways. Because much of the existing telecommunications infrastructure is located within the right-of-way associated with roads, this model closely approximates actual costs based on the existing network. The public service commissions of both North Carolina and South Carolina recommended this model to the FCC, largely on the basis that this model appears to locate rural customers more precisely than does the Hatfield model and accurately reflects actual costs of providing services.

Hatfield Associates Inc. (HAI)

The HAI model, developed by Hatfield Associates Inc., on behalf of AT&T and MCI and commonly preferred by competing local exchange carriers, uses geocoded database information (purchased from Metromail) to locate customers within census block groups (CBGs). The locations of customers who are not included in the database are interpreted to be evenly distributed around the perimeter of the census block group, which is assumed to be square. The network switching locations are assumed to be where they currently exist, and a model of the costs of providing service from the switch location to the customers is calculated based on the most efficient network using available (but not necessarily implemented) technologies. Louisiana recommended this model to the FCC because it was more accurate at locating customers in urban areas and as accurate at locating rural customers as BCPM, and it represented a more cost-effective solution for providing telecommunications services. Louisiana is one of seven Southern states for whom monthly support is likely to be roughly equal, regardless of which proxy model is used. However, Oklahoma, Arkansas, Mississippi, Alabama, and Kentucky would receive substantially less support when using the HAI model instead of BCPM [29].

Hybrid Cost Proxy Model (HCPM)

In an effort to address the problematic aspects of both models, the FCC chose to pursue a third model, the Hybrid Cost Proxy Model (HCPM). This model is a modified form of the HAI model, which gives a choice of three different clustering algorithms to locate customers in its theoretical network and two ways to define the network (using airline distance or rectilinear distance, which may approximate a grid-based road system). In Version 2.6, released in December 1998, the HCPM is specific, but since it has so much flexibility in terms of inputs, the results are not very predictable. More specific guidelines regarding acceptable inputs are needed for this model to help provide a predictable fund for universal service. Whether the resulting fund will be sufficient to provide universal service is also questionable; by "building" the lowest-cost network, the model may not provide enough redundancy in the network to be reliable [9].

For non-rural areas, complete forward-looking economic cost models were scheduled to be completed in May 1999 and to take effect on July 1, 1999. Under these, states may either use the Federal Communication Commission's cost methodology or develop their own cost studies, within FCC

guidelines, to determine the level of intrastate universal service support for carriers in that state. In the interim, high-cost providers in non-rural areas continue to receive the same level of support they did prior to the Telecommunications Act of 1996 for three years. Under this order, carriers in rural areas also continue to receive essentially the same support they did prior to the 1996 Act, while the Commission continues to evaluate various forward-looking economic cost models for rural areas.

The FCC's Rural Task Force was to complete a draft recommendation by December 1999 for a cost support mechanism for rural areas which, in addition to addressing the Act's requirements that it be "specific, predictable and sufficient," also would seek a mechanism that is administratively workable. The complexity of all cost proxy models proposed thus far has been a major stumbling block. The Rural Task Force was also asked to identify whether additional variables should be included when calculating forward-looking economic cost. Depending on the task force's recommendation, the modified proxy model could be used for rural carriers beginning in July 2001 [29].

Affordability

The Commission previously had in place some explicit support mechanisms directed at making service affordable for low-income consumers of the Lifeline program, which provides monthly assistance for local telephone service, and the Link Up program, which provides assistance with telephone installation/connection fees. These programs are to be continued under the 1996 Act, as well. The Lifeline program provides $5.25 in federal support per line, and additional federal funds are available depending upon whether a state has contributed additional support. Three Southern states (Arkansas, Kentucky and Louisiana) have no Lifeline program, so residents are eligible for only the $5.25 in federal support per line. Oklahoma provides an additional $1.17, matched by 58 cents in federal money, for a total of $7 in monthly support. The remaining southern states provide $3.50 in Lifeline support, which is matched by an additional $1.75 in federal dollars, for a total of $10.50 in monthly support on a per line basis [23].

The FCC accepted the Joint Board's evaluation that the high number of subscribers (92.4 percent) in 1996 implied that telephone service was generally affordable; and with that in mind, the FCC and the Board chose to leave the subscriber line charge for first residential lines at $3.50 per month to help maintain service levels for low-income consumers.

State Responsibilities

The FCC also recognized that a determination of rate affordability also must include additional factors, such as whether the range of the local calling area includes access to essential services such as fire protection, police protection, or health care providers. For example, "rural consumers who must place toll calls to contact essential services that urban consumers may reach by placing a local call cannot be said to pay 'reasonably comparable' rates for local telephone service when the base rates of the service are the same in both areas." Income levels, cost of living, and population density also play a part in affordability, and these are best identified at the state level. States are encouraged to submit summary reports of state-level data, for use by the FCC in determining overall affordability.

Schools and Libraries

Section 254 stipulates that schools and libraries receive services at discounted rates. The order specifies the amount of the discount from 20 to 90 percent depending on the economic conditions and rural or urban character of the school's students.

While information services are generally excluded from federal universal support mechanisms, due to the specific requirements of Section 254, advanced telecommunications and information services are included for schools and libraries. Eligible schools and libraries can apply discounts to information services including:

- The transmission of information as a common carrier;
- The transmission of information as part of a gateway to an information service, where that transmission does not involve the generation or alteration of the content of information but may include data transmission, address translation, protocol conversion, billing management, introductory information content, and navigational systems that enable users to access information services that do not affect the presentation of such information services to users; and
- Electronic mail services, including e-mail.

Other information services, such as voice mail, are not eligible for support at this time.

Support for Health Care Providers

Under Section 254(h), public and nonprofit health care providers that are located in rural areas and meet certain statutory requirements are eligible for support for any telecommunications service of a bandwidth up to and including 1.544 mbps that is necessary for the provision of health care services.

The relatively high transmission capacity that is supported as a minimum comes from the unique character of the needs of rural health and time-critical factors. For example, the transmission of a single study of chest X-rays containing four film images would take 3.5 hours to transmit over a 28.8 modem, 40 minutes over an Integrated Services Digital Network (ISDN) line, and only 4 minutes over a T-1 line at 1.544 mbps.

The FCC-established Advisory Committee on Telecommunications and Health Care described a "market basket" of "essential telemedicine applications" which are "necessary to support rural telemedicine efforts." The applications in the market basket include:

- Health care provider-to-provider consultation between professionals in rural hospitals and clinics, and professionals in other locations.
- Provider-to-patient consultation, including the examination or counseling in a multimedia format of patients in rural hospitals and clinics by professionals in urban hospitals.
- Continuing medical education programs for rural physicians and other health care providers.
- Twenty-four hour support from physicians and specialists either at urban centers or at a local physician's office.

- Specialty image-intensive services—such as radiology, dermatology, selected cardiology, pathology, obstetrics (fetal monitoring), pediatric, and mental health/psychiatric services—the diagnostics, data, and images of which should be able to be transmitted at high speed.
- Interaction between emergency departments and trauma centers in urban areas and helicopters and ambulances at the scene of emergencies in rural areas.

Capping and Administrative Mechanisms

Universal service support is subject to the following annual caps:

- Schools and libraries support is capped at $2.25 billion per year. In the 1998 funding year, approximately $1.6 billion was committed as of February 1999. While rural entities were awarded 43 percent of the funded applications, they received only 2 percent of the total dollars committed. Health care support is capped at $400 million per year. Both are administered through a not-for-profit organization called the Universal Service Administrative Company. The Schools and Libraries Division (http://www.sl.universalservice.org/) is the not-for-profit organization that is responsible for administration of the schools and libraries portion of the fund. Contribution assessments are evaluated on a quarterly basis, both on the total amount of payments made for universal service support discounts, and recommended contribution assessments for the next quarter.
- The Rural Health Care Division (http://www.rhc.universalservice.org/) is responsible for the administration of the health care portion of the fund. The application process for both schools and library support and rural health care support is outlined in detail on the web site.

Interstate Subscriber Line Charges

Interstate subscriber line charges remain capped at $3.50 per line for the first residential lines. The subscriber line charge for additional residential lines is capped at $6.07 [23].

Presubscribed Inter-Exchange Carrier Charge (PICC). The FCC set this charge at $0.53 per line to help recover costs in addition to those covered by the subscriber line charge. Some companies charge more than this [23].

Universal Service Charges. While the FCC did not direct telephone companies to pass on the costs associated with the Universal Service Fund to their customers, most have. The cost for residential customers varies from 75 cents per line to 5 percent of a customer's interstate long distance bill [23].

State Telecommunications Regulation

With the breakup of AT&T, state regulators suddenly had more work to do. States developed unique pricing strategies to provide equal access to telecommunications technology to all of their residents.

Some of the innovative pricing strategies pursued by states between 1984 and 1996 included:

- Rate restructuring—typically bringing rate-of-return structures based on telephone companies' expenses and capital investments closer to actual costs;

- Deregulation—In Nebraska, telecommunication service rates were deregulated in 1986 as part of a strategy to increase the telemarketing industry in the state;
- Social contract regulation—used by Vermont and Kansas to offer rate flexibility in exchange for increased investments in telecommunications infrastructure;
- Incentive regulation—which allowed telephone companies to keep a higher percentage of profits as an incentive to increase operational efficiency.;
- Price caps—which were intended to create incentives for companies to increase efficiency and reduce costs, allow companies to price their services up to the specified maximums; and
- Capital depreciation rate restructuring—to encourage infrastructure investment. However, the accelerated depreciation schedules allow companies to recapture their investment more quickly, thus resulting in higher rates for customers.

In addition, some states have taken the lead in promoting investment in telecommunications infrastructure. For example, Georgia put in place two initiatives that led to the private-sector development of a high-speed infrastructure to serve the entire state, aptly named the "Ring Around Georgia" project. As a result of these investments, Georgia's rural areas enjoy some of the most advanced telemedicine services available today [6]. The challenge is to neither overinvest nor underinvest in an infrastructure that is inappropriate for the needs of the state.

States also took some steps toward creating more competitive environments for local exchange carriers, though progress on this front had not advanced as far as rate restructuring and infrastructure innovation before the 1996 Act.

Activities During 1996–1998

With the enactment of the Telecommunications Act of 1996 and the subsequent FCC regulations, state regulators have clearer guidance on matters of competition among local exchange carriers. States also have specific responsibilities to ensure that universal service funding meets the minimum established by the FCC. However, states may elect to structure their rates in such as way as to create state universal funds, as well. Also under the 1996 Act, it now falls to state PUCs to provide direction to local exchange carriers when negotiating interconnection agreements with competing LECs, and to arbitrate those agreements if necessary.

Under the definition of "basic" universal service established in the May 7, 1997, order, so-called "advanced" service was left out of the picture. In the interim, it fell to states to decide how to promote advanced infrastructure development, if they chose to do so. In practice, Southern state public service commissions have had their hands full with ensuring fair and just conditions for local competition, with positive results; however, progress on expanding the "advanced" telecommunications infrastructure and services has been less widespread.

1997 and Beyond Activities

Section 706 of the Telecommunications Act of 1996 specified a 30-month look-back period to see whether advanced telecommunications service is being provided at affordable rates, and a requirement to

take action to remedy the situation if necessary. The FCC's February 2, 1999, report summarizes the results of that inquiry, and notes that advanced telecommunications service is about as available as comparable technologies such as the analog telephone, black and white television and cellular phones were two years after becoming available, but that further inquiries were needed to ensure continued development. States have a compelling responsibility to make a realistic assessment of their current situation and project future needs, and to provide input into the annual FCC inquiries. Especially in light of the potential impact that telecommunications technology can have on rural areas, rural states must take an active role in charting the course for advanced telecommunications services.

Implementation of the 1996 Act by Public Service Commissions in Southern States

Based on the authors' review of commission web sites in September 1998, most state activity resulting from the Telecommunications Act of 1996 has centered on ensuring fair competition for telecommunications providers and responding to complaints from consumers about unscrupulous business practices. Some states have taken steps to define and put in place policies to encourage advanced telecommunications availability, but in general, this has taken a back seat to the competition and consumer protection issues.

Competition

All 13 Southern states have issued new certificates to provide inter-exchange or local exchange service since 1996, indicating that telecommunications providers are indeed entering new markets. Florida alone has 267 competing telephone companies, along with 10 incumbent telephone companies. Five states have issued new tariffs or otherwise changed regulations for extended area services, three have assisted telecommunications providers in negotiating interconnection agreements and five have addressed issues regarding unbundled network element pricing. Two who have done so most recently, Alabama and Mississippi, have included vertical services (call waiting, caller ID, and so on) in the list of items that are to be unbundled. At this writing, the FCC is seeking comments on a national standard list of elements which are to be unbundled (FCC 99-70), since the United States Supreme Court found the FCC's order on unbundling to be unclear with regard to services that are "necessary" and which would "impair" a competing telephone company's ability to compete if they are not made available on an unbundled basis.

Six states prepared reports for the FCC regarding the incumbent telephone company's compliance with the 14-point checklist in Section 271 (see Appendix B for the list of these 14 points), which would allow the incumbent local telephone company to begin selling long-distance services. Three of the six found that the incumbent had satisfied all the requirements of the checklist; three did not.

Consumer Protection

Related to the increased competition, two "competitive" techniques have come under scrutiny of state regulators. Seven states have drafted regulations or provided consumer alert information regarding slamming, in which a consumer's long-distance provider is changed without the consumer's express permission. Four states have issued similar directives regarding cramming, in which a consumer is

Table 3. Summary of Issues Addressed by Public Service Commissions in Southern States, 1996-1998.

State/territory Web site	Certificates to provide inter-exchange or local exchange services	Unbundled network element pricing	Public pay telephones	Interconnection agreements	Expanded area services	271 compliance	USF	Slamming	Cramming	Forward-looking cost study	Area code overlays	Prepaid local service	Reciprocal Compensation
Alabama www.psc.state.al.us	X	X	X	X	X								X
Arkansas www.state.ar.us/psc	X					X (SWBT)	X						
Florida www2.scri.net/psc/index.html	X		X	X				X	X				
Georgia www.psc.state.ga.us	X				X	X (BellSouth)							X
Kentucky www.psc.state.ky.us	X							X					
Louisiana www.lpsc.org	X	X	X					X		X (Hatfield)			
Mississippi www.mslawyer.com/mpsc/mpsc.html	X		X			X (BellSouth)		X		X (Declined)		X	
North Carolina www.ncuc.commerce.state.nc.us	X	X	X	X				X	X	X (BCPM3.1)			
Oklahoma www.occ.state.ok.us	X						X				X		
South Carolina www.psc.state.sc.us	X	X				X (BellSouth)				X (BCPM3.1)			
Tennessee www.state.tn.us/tra	X		X	X	X	X (BellSouth)		X	X				
Texas www.puc.state.	X		X		X	X (SWBT)	X	X	X		X	X	

Source: Based on the authors' review of commission web sites in 1998 and May 1999; some states may have addressed issues that do not appear on their web sites.

charged for additional services, again without explicit permission. In addition, Mississippi has declared that telecommunication providers must only do business under one name, and all bills must show that name.

Universal Service

Eight states have reviewed or issued new regulations regarding public pay telephones, or are in the process of doing so. Keeping pay telephones available in high-cost areas is a difficult challenge as telecommunications companies seek to reduce unprofitable parts of their business. Four states have implemented or adapted state Universal Service Funds. Oklahoma's Universal Service Fund provides up to five access lines for public schools, libraries, county seats and not-for-profit hospitals, as well as 56 kbps lines for Internet access for public schools and libraries.

Four states have published their forward-looking cost study information that was submitted to the FCC for the purpose of calculating interstate universal service funding. North Carolina and South Carolina chose the BCPM method, Louisiana chose the Hatfield method, and Mississippi declined to select a method.

Reciprocal Compensation

Alabama and Georgia have addressed the issue of reciprocal compensation to compensate a local telephone company for completing a call placed by a competitor's customers. Typically, the calls involved with reciprocal compensation are related to Internet access, or the "Internet peering" issue noted in the FCC's February 1999 report. The FCC notes that it does not intend to regulate Internet access, and that reciprocal compensation is to take place between telephone companies and not be passed on to consumers [21].

New Technologies to Watch For

Technological Innovations

Consistent with the intent of the Telecommunications Act of 1996, telecommunications innovations continue to flourish, and competition has generated some creative solutions for providing access to advanced telecommunications. Some will no doubt influence state policy decisions; others may be useful as a gauge to evaluate the effectiveness of policy. These new technologies will need to be included in discussions about equal access at a reasonable cost.

Hardware

Point-to-point two-way communication technologies and broadcast receiver-only entertainment technologies used to be separate. The line between these two camps has all but disappeared behind interconnection agreements, innovative marketing programs and increasing competition. Listed below are the key hardware systems of the telecommunications area:

- Local loop and inter-exchange network—As of 1994, the network encompassed 145,000 local access lines which provided a link to the "world's largest distributed network" for "point-to-point voice, fax, data, and videoconferencing services." This network contains diverse elements from fiber-optic cable and digital switches to twisted-pair copper lines with party-line service.

- Plain Old Telephone Service (POTS)—Plain Old Telephone Service typically refers to the copper-cable voice-frequency analog portions of the telephone network which transmit signals from a customer's location to the telephone switching office, where they are routed to the final destination.

- Mobile wireless—Mobile wireless service includes analog cellular and digital cellular technologies. Wireless technologies are used by 67 percent of households, and 42 percent report that they would be willing to switch from their wireline local loop provider to a wireless one if the costs were comparable.

- Stationary/local loop wireless—Stationary wireless technologies offer the ability to provide high-speed wireless local loop service connecting a business or residence to a land-based receiver, and then to a wireline network. Similar to mobile cellular phone systems, these technologies require co-location of receiving stations within a relatively short range. Teligent (http://www.teligent.com) is one company currently offering this type of service in selected markets throughout the United States.

- Low-earth orbit satellites—Currently in development by a number of satellite partnerships, low-earth orbit satellites (LEOs) hold promise for both fixed and mobile wireless users. Iridium (http://www.iridium.com) is one example of an LEO company that focuses on the needs of mobile users in remote areas where land-based cellular service is unavailable; maritime, aircraft and remote third-world locations are the initial target areas. LEO service offers the ability to link directly from a customer's telephone to the satellite.

  A significant advantage of the LEO satellite over geosynchronous satellites is the elimination of the .25-second delay of transmission. Because the orbit is much lower, the signal does not have to travel as far; therefore, the delay is eliminated.

  Once their satellite networks are in place, LEO providers could provide cost-effective fixed local loop service to rural areas. See http://www.comlinks.com/satcom/satmenu.htm for a list of satellite providers currently building networks. Teledesic and Iridium are particularly interesting in that the satellites themselves are networked together, rather than bouncing their signals back to land-based stations. This form of networking may change assumptions and practices regarding telecommunications networks and switches, and bears continued observation.

- Cable television network—The cable television service network is almost as accessible as the telephone local loop network. According to the GAO, "cable service is available to 96 percent of households in this country." By virtue of their higher bandwidth capabilities (coaxial cable, fiber-

optic cable), cable television networks seem well-positioned to compete with telephone companies for p oint-to-point communications requiring high-bandwidth connections; however, this type of competition requires additional switching equipment to enable the two-way communication required for telephony.

With the installation of the required switches, cable modems are being used with increasing frequency for data transmission; the extent to which cable companies are able to capture a portion of the voice communications market remains to be seen.

- Direct Broadcasting GEO/VSAT Satellites—In 1996, direct broadcasting satellites had about 2 million customers, compared with 63 million cable subscribers. By 1998, more than 4 million subscribers had signed up for digital satellite service. These technologies use a one-to-many distribution network similar to that used by cable networks, which works well for entertainment distribution. The rate of data transfer is high, much higher than can be achieved in many wireline networks. However, geosynchronous satellites (hovering above the earth at about 22,300 miles) are subject to an unfortunate quarter-second lag between the time data is sent and when it's received, which makes this technology less attractive as an interactive communication tool. Geosynchronous (GEO) satellites are located above the equator and rotate with the earth; they require large antennas to receive data. Very small aperture terminal (VSAT) satellites transmit energy to a smaller geographic area and connect to small ground antennas; they also are linked by a hub terminal. Hughes DirecTV (http://www.directv.com) is one example of VSAT technology.

- SS7/AIN/VPN—The Signaling System 7 (SS7) protocol provides a mechanism for a dedicated high-speed data network apart from other existing networks. Related technologies that are facilitated by this protocol include advanced intelligent networks (AIN) and virtual private networks (VPNs).

- ISDN—Integrated Services Digital Network provides a digital network of services using, in many cases, existing copper lines to provide transmission speeds of 128 kbps or more. Voice, data and low-resolution video are supported by ISDN.

- ADSL—Asymmetrical digital subscriber line technology is another technology, which leverages *existing* copper wireline to transmit voice, video and data at speeds of 384 kbps or more. DSL technology comes in many forms, and holds great promise for "the last mile" for many areas.

- ATM/SONET (B-ISDN)—Asynchronous transfer mode/synchronous optical networks provide high-speed transmission capabilities for the most intensely-used portions of the telecommunications network. These networks are anticipated to operate at speeds up to 2.488 gbps.

- Personal communication networks—These networks would combine all telecommunications systems, providing person-to-person connections via cellular, satellite and wireline networks.

- Fiber-to-the-curb—This is an option in which optical network units are installed which serve a number of residences. Some cable companies are routinely installing fiber trunk feeders, which are capable of fully switched ATM/SONET services. ATM/SONET refers to asynchronous transfer

mode/synchronous optical network, which provides high speed transmission capabilities for the most intensely-used portion of the telecommunications network.

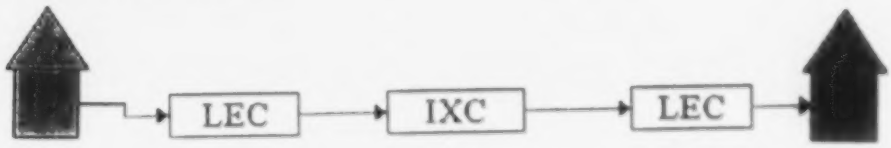
Convergence of Broadcast and Point-to-Point Media

The convergence of broadcast and point-to-point media provides interesting challenges for policymakers.

Point-to-Point POTS Telephone Service

Before 1984, things were simple. In general, a consumer had one option for local telephone service and one option for long-distance service. The transmission of telephone service occurred over a wire, either copper or in some cases fiber-optic cable. The consumer could initiate a connection with some other consumer, and analog voice data traveled back and forth over the circuit formed by the connection between the two end points.

Figure 1. Point-to-Point POTS.



This model was fairly easy to understand. An individual consumer had one technology choice (wire), one local provider and one long-distance provider.

After the 1984 Modified Judgment

After the modified judgment, consumers had a choice of long-distance providers, and many of these providers implemented new technologies to better serve their customers and increase capacity between the local exchange provider and the inter-exchange provider. Consumers did not yet have a choice of technologies, as the local loop (the part of the network connecting the local exchange carrier with the consumer's home or business) generally remained the copper wire.

Today's Telecommunication Technologies

With the introduction of the Telecommunications Act of 1996, consumers now have a choice of local exchange carrier, and many of those carriers now offer alternative technologies for "the last mile," the connection from the local switching office to the consumer's home or office.

The complexity of choices that were previously unavailable offers unique challenges for state policymakers. Questions of how to:

Figure 2. After the 1984 Modified Judgment.

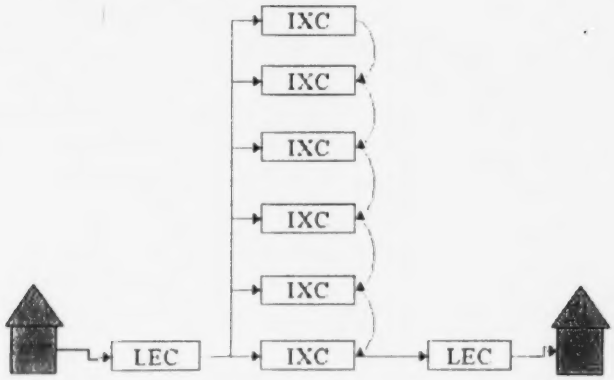
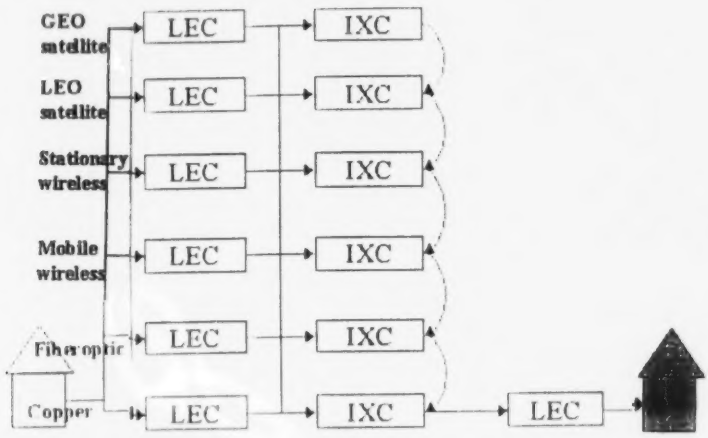


Figure 3. Today's Telecommunications Technologies.



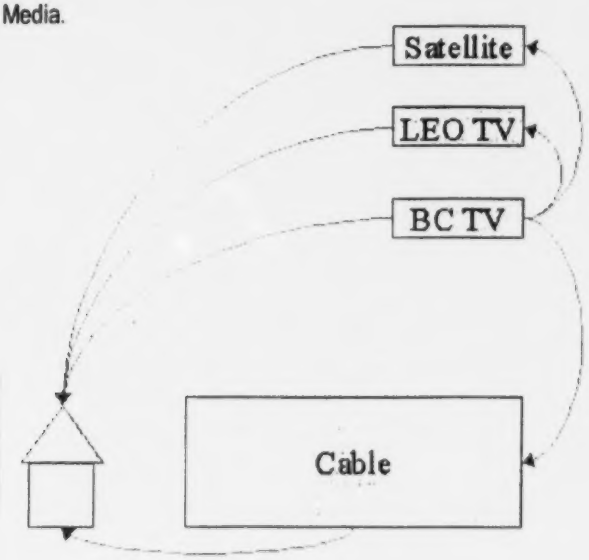
- Ensure that consumers understand the technology options that are available to them;
- Ensure that interconnection agreements are negotiated fairly for all companies involved;
- Identify appropriate methods of costing the unbundled network elements;
- Ensure that the Universal Service Fund accounting process does not put undue hardship on small rural LECs; and
- Ensure that advanced telecommunications services are available in rural areas as well as urban areas.

To make equal access of sophisticated telecommunications technology at a reasonable cost, additional monitoring mechanisms will probably be needed because of the complexity of the new regulated competition model.

Broadband Media

Parallel to the development of the point-to-point communication network of the telephone system, broadcast media such as television and radio followed a similar, but different course. First of all, with broadband media, the consumer can only receive information or entertainment programming; there is no two-way communication as in the telephone system. Today's so-called broadcast media no longer implies the use of airwaves—rather, cable (either fiber-optic or coaxial) is widely used. Most existing television and radio remain analog, though digital technologies like High Definition Television (HDTV) are slowly being phased in.

Figure 4. Broadband Media.



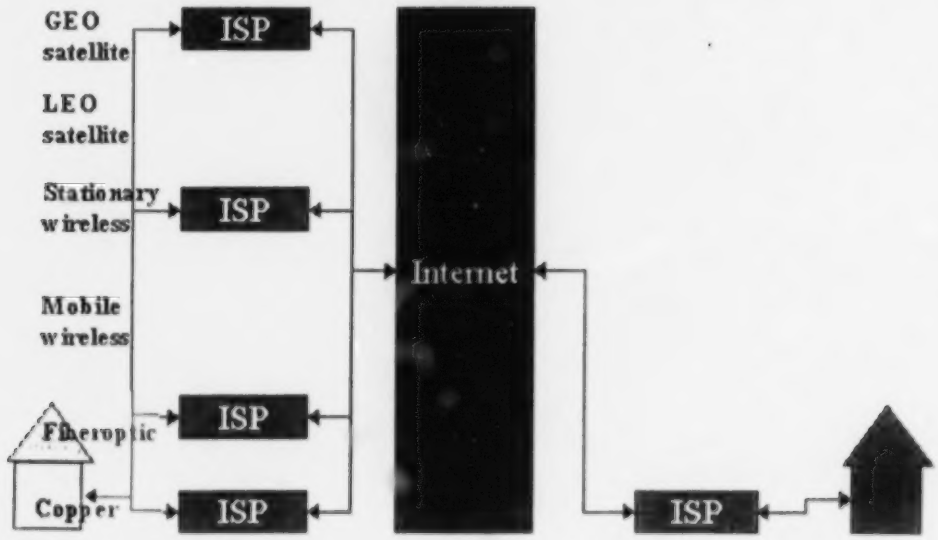
The Internet Changes Everything

The Internet combines some of the same characteristics as point-to-point communication and broadband entertainment systems into something completely different. The foundation of the Internet is the "Internet backbone." Connections to the Internet backbone have, in the past, been made directly to the backbone or through an Internet Service Provider (ISP) which is usually accessed via a dial-up connection over POTS telephone lines. As demand for higher bandwidth has increased, portions of the existing backbone have been upgraded to handle higher capacity. Internet II will provide even higher transmission speeds when it is fully operational.

Intended originally as a communication medium (via e-mail, and more recently Internet Relay Chat (IRC), multi-user domains (MUDs) and videoconferencing), the Internet also includes the World Wide Web, which has rapidly grown from an archaic assortment of bulletin boards to a popular destination for entertainment and commerce, all accessed from your very own home.

The key distinguishing feature about Internet technology is that Internet protocols are packet-switched protocols. Unlike the circuit-switched protocol which essentially keeps a consistent "pipe" of

Figure 5. The Internet Changes Everything.



bandwidth open—and mostly empty—the entire time two parties are talking, packet-switched protocols do not claim their own space. Instead, digital information is broken down into packets with the address of the destination, and the packets are thrown into the pipe, intermingling with other packets until finally reaching their final destination where they are reassembled. The technology used to transmit the packets is irrelevant, as long as it is capable of transmitting digital information. And, of course, the faster the better. Another notable distinguishing factor about the Internet is that it is truly interactive, providing two-way communication in real time.

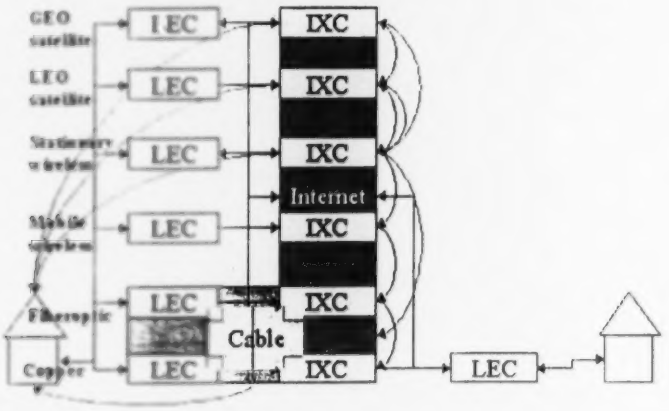
So how does the Internet change everything? By acting as a bridge between telephone systems and broadband media, the Internet brings about convergence—the merging of all telecommunications technologies into one huge supersystem, also known as the "Information Superhighway."

All Together Now—The Dawning of the Age of Convergence

Even before the Telecommunications Act of 1996, the lines of voice, data and entertainment were blurring. With the first phase of implementation of the Act underway, more and more companies are offering multiple services or packages that include voice, data and entertainment access. For consumers, this new world of choices regarding technologies, local exchange carriers, inter-exchange carriers, Internet service providers, and television service providers may be bewildering. Telecommunications companies who are able to provide "simple" solutions to the multitude of options are in growing demand.

One emerging technology that is of concern to federal regulators is Internet Protocol (IP) telephone systems, which uses the packet-switched network to provide voice connectivity. Internet service providers who use their own transmission facilities that do not rely on the public switched network are currently exempt from contributions to or subsidies from the federal Universal Service Fund. Telecommunications providers who lease lines to Internet service providers are providing "telecommunications"

Figure 6. All Together Now—The Dawning of the Age of Convergence.



services and, therefore, are required to contribute to universal service support mechanisms. Some states have taken steps to regulate intraLATA IP telephone system. The potential impact of this technology on monies available for universal service must be evaluated against its promise to provide competition and, thus, lower prices for consumers. This issue will, of course, be critically important for rural areas.

Software

Software is perhaps the most instructive aspect of telecommunications technology, because many of today's information technology software products are designed to make up for relative inadequacies in telecommunications access. Policymakers can look at the availability and deployment of different types of software as an indication of the relative health and robustness of the telecommunications infrastructure.

For example, thin-client technologies allow remote connectivity with as little as 20K of bandwidth, which can generally be supported using most of today's POTS infrastructure. As a short-term strategy, these technologies can help rural areas leverage their existing infrastructure.

As advanced telecommunications become more common, software developers will begin to assume that bandwidth will be available. Rural areas will be particularly vulnerable when that happens.

Peopleware

The third category of technology innovation involves peopleware; literally, the interaction of the people who use technology with that technology. Makers of both hardware and software are recognizing that making their products easier to learn and use can be a competitive advantage. However, most advanced telecommunications technologies currently require at least some specialized training.

Consistent with the desire of rural people for education and training on telecommunications technologies, policymakers should consider education and training. In particular, states need to continue

their traditional investments in basic education, and may need to provide additional support for technology-related education.

Along with providing support to help citizens understand how to use these technologies, communities may need to consider training on how and when not to use them. As previously noted, new research suggests that there may be negative social effects of extensive Internet use, including increased loneliness, depression and a reduction in social interaction.

Successful states in the Information Age will balance the need for competition and equal access while providing continued education on how to use these new technologies more effectively.

State and Local Community Decision Checklist

The legislative, regulatory and technological changes in telecommunications mean that states now face a number of policy changes. Some are mandated by the 1996 Telecommunications Act, still others come about as a result of the FCC's actions in the May 1997 Order, and others are brought about by the rapidly changing nature of the telecommunications markets.

The following topics need to be addressed by (1) state policymakers, (2) state regulatory agencies (PSCs and PUCs), (3) local elected officials, and (4) interested citizens. Numbers in parentheses indicate which of these groups should be engaged in the dialogue about these items.

Ongoing Items

- Review the FCC and your state's PUC web sites for actions that affect you. For more information, see http://www.fcc.gov, http://www.fcc.gov/statelocal/ and http://www.naruc.org/stateweb.htm. (1, 3, 4)
- When the FCC or PUC request commentary on items that affect rural areas, provide comments to ensure that your concerns are considered when policies are adopted at the federal and state levels. (1, 2, 3, 4)
- Put in place a mechanism for distributing relevant information to consumers, as well. Many state public utility commission web sites have a "consumer information" section; press releases and brochures also are frequently used. (2)

Competition

- Create a level playing field for competition among local telecommunications providers. If state regulations had previously constituted any sort of barrier to entry for new local providers, the Telecommunications Act of 1996 preempts those regulations. (1, 2)
- Provide assistance to telecommunications companies in negotiating interconnection agreements, if necessary. (2)

- Set tariffs for unbundled network elements using appropriate cost models. (Currently, Hatfield or Bellcore's TELRIC models are the ones most commonly proposed.) (1, 2)
- Specify access charges for interconnections. (2)
- Evaluate the incumbent local exchange provider's progress in terms of the fourteen-point checklist outlined in Section 271 of the Telecommunications Act of 1996; when all items have been satisfactorily met, grant the incumbent LEC the ability to compete in inter-exchange markets as well. See Appendix B for more information. (2)
- Provide mechanisms for consumer protection from overzealous telephone competitors using tactics like slamming and cramming. (1, 2)

Universal Service

- Familiarize yourself with the provisions of the Telecommunications Act of 1996 regarding universal service, particularly Section 254 addressing universal service, Section 271 dealing with competition and universal service, and Section 706 regarding advanced telecommunications availability in all areas. (1, 2, 3, 4)
- Pay close attention to, and participate in, ongoing, annual FCC inquiries into whether advanced telecommunications services are universally available at just and reasonable costs. Depending on the outcome of those inquiries, the FCC may impose additional regulations, and states may choose to do the same. (1, 2, 3, 4)
- Educate yourself about the HCPM forward-looking cost model selected by the FCC for the federal interstate Universal Service Fund for non-rural areas, as well as the cost model that is selected for rural areas. The HCPM is available for downloading from http://www.fcc.gov. (1, 2, 3, 4)
- Take steps as needed to ensure the provision of basic universal services in rural and high-cost areas, such as pay telephones, LifeLink support, dual-party relay support, and so on. (1, 2)
- Provide testimony or commentary to state and federal entities to help ensure the provision of basic universal services in rural and high-cost areas, such as pay telephones, LifeLink support, dual-party relay support, and so on. (3, 4)
- If needed, establish a state Universal Service Fund to help ensure intrastate universal service at "reasonable rates." (1, 2)
- Select an appropriate forward-looking cost model (BCPM, HAI, HCPM, or something else) for your state's intrastate Universal Service Fund. (1, 2)
- Educate schools and libraries about the process for obtaining federal universal service discounts for advanced telecommunications. See http://www.sl.universalservice.org for details. (1, 2, 3, 4)
- Educate rural health care providers about the process for obtaining federal Universal Service Funds for advanced telecommunications. See http://www.rhc.universalservice.org for details. (1, 2, 3, 4)

Advanced Telecommunications for Rural Areas

- Evaluate the existing level of availability of advanced telecommunications as compared with the demand for those services in rural areas. (1, 2, 3, 4)
- Proactively decide what level of advanced telecommunications is appropriate for your state or

community, given its unique characteristics. If appropriate, define what constitutes "advanced telecommunications" above and beyond the FCC's definition of 200 kbps for your state or community and establish mechanisms to encourage the development of those technologies in rural areas. (1, 2, 3, 4)

- Provide or encourage the development of "peopleware" training to enhance the usefulness of telecommunication technologies. (1, 2, 3, 4)
- Create community-based coalitions to assess needs regarding telecommunications training. (3, 4)

Conclusion

The Telecommunications Act of 1996, and the resulting Federal Communications Commission rule-making activities, have drastically changed the environment in which telecommunications companies will compete in the next century. The role of state public utility commissions changed dramatically with the adoption of the Telecommunications Act of 1996. Since then, most states have taken steps to provide a more pro-competitive environment; some states have been exceptionally proactive in this regard. More changes are underway, and states have a duty to balance the need for competition with the imperative for universal access to telecommunications. Two items of particular importance to Southern rural states are the selection of a proxy model or other cost support mechanism for universal service to rural areas and the ongoing evolution of the definition of "advanced telecommunications." Rural residents should pay close attention to which model is adopted in their state to reduce the possibility of limiting universal service dollars for development of instruction in local communities.

The potential impact of telecommunications technology on rural areas is significant, both on overall quality of life and on rural businesses. To date, rural businesses have found that telecommunications technology does expand their market regions and helps increase profitability. To ensure that telecommunications technology continues to have these positive effects, state, county and local leaders will need to work and plan together to chart the course for the new century.

Where in the past, public service commissions could use implicit subsidies to maintain service in rural areas, explicit subsidies linked to universal service is now required by federal law. This change makes it more important for state policymakers to monitor access and cost issues to ensure that everyone in their state has an opportunity to benefit from new telecommunication technologies.

This report has provided a snapshot of the implications of the Telecommunications Act of 1996 for rural communities in the Southern states, but it is by no means an exhaustive summary. New developments in both telecommunication technology and telecommunications regulation are continuing at a breakneck pace. Wise community leaders will not only find ways to keep up with the changes in telecommunications, but will also play an active role in shaping the way they are employed in their states and local communities.

Appendix A: Federal-State Joint Board

To determines the interstate rates, the services, and how to raise the funds necessary to pay for the services listed under Section 254 of the Telecommunications Act of 1996, the Federal Communications Commission (FCC) appointed a Federal-State Joint Board to recommend changes in existing FCC rules to fulfill these regulatory mandates. This group consisted of three FCC Commissioners, four State Commissioners, and one consumer advocate. The following membership list was taken from the FCC web site.

FCC Listings

Ness, Susan, Commissioner, FCC Joint Board Chair
Furchtgott-Roth, Harold, Commissioner
Tristani, Gloria, Commissioner
Kinney, Linda, Legal Advisor to Commissioner Ness
Whitesell, Sarah, Legal Advisor to Commissioner Tristani
Martin, Kevin, Legal Advisor to Commissioner Furchtgott-Roth
Armstrong, Linda, Assistant Division Chief
Boehley, Lisa, Attorney
Brown, Craig, Deputy Division Chief
Burnett, Steve, Public Utilities Specialist
Clopton, Bryan, Public Utilities Specialist
Firth, Andrew, Attorney
Flannery, Irene, Division Chief
Fullano, Genaro, Attorney
Keller, L. Charles, Deputy Division Chief
King, Katie, Attorney
Loube, Robert, Telecommunications Policy Analyst
Miillin, Brian, Interpreter
Nadel, Mark, Attorney
Smith, Richard D., Attorney
Valinoti, Elizabeth H., Attorney
Vitale, Matthew, Attorney
Webber, Sharon, Attorney
Zinman Jack, Attorney

State Listings

Johnson, Julia, Commissioner, Florida Public Service Commission, State Joint Board Chair
Hogerty, Martha, Missouri Office of Public Counsel
Schoenfelder, Laska, South Dakota Public Utilities Commission
Wood, Patrick H. III, Chairman, Texas Public Utility Commission
Adams, Sandra Makeeff, Accountant, Iowa Utilities Board
Bluhm, Peter, Director of Policy Research, Vermont Public Service Board Research
Bolle, Charlie, Policy Advisor, Nevada Public Utilities Commission
Curry, Rowland, Policy Consultant, Texas Public Utility Commission
Johnson, Carl, Telecommunications Policy Analyst, New York Public Service Commission
Kenyon, Lori, Common Carrier, Alaska Public Utilities Commission
McCarter, Doris, Economist, Ohio Public Utilities Commission
McClelland, Philip, Assistant Consumer Advocate, Pennsylvania Office of Consumer Advocate
Meisenheimer, Barbara, Consumer Advocate, Missouri Office of Public Counsel
Miller, Susan Stevens, Assistant General Counsel, Maryland Public Service Commission
Nelson, Thor, Rate Analyst/Economist, Colorado Office of Consumer Counsel
Newmeyer, Mary E., Federal Affairs Advisor, Alabama Public Service Commission
Wilson, Tom, Economist, Washington Utilities and Transportation Commission

Observer Status Positions

Dean, Ann, Assistant Director, Maryland Public Service Commission

Dowds, David, Public Utilities, Supervisor: High Cost Model, Florida Public Service Commission

Durack, Don, High Cost Model: Staffer for Barry Payne, Indiana Office of Consumer Counsel

Fogleman, Greg, Economic Analyst: High Cost Model, Florida Public Service Commission

Faris, Machele, South Dakota Public Utilities Commission

Myers, Anthony, Technical Advisor: High Cost Model, Maryland Public Service Commission

Ramsay, Brad, Assistant General Counsel, NARUC

Zake, Diana, High Cost Issues: Staffer for Rowland Curry, Texas Public Utility Commission

Zakriski, Tim, New York Department of Public Service

Appendix B: Section 271 Fourteen-Point Checklist

Several states already have been asked to evaluate whether incumbent local exchange carriers are providing all the interconnection access to additional unbundled network elements specified by the FCC, thereby allowing the incumbent to enter new markets once those requirements have been satisfied. According to the competitive checklist specified in Section 271 (b) of the Telecommunications Act of 1996, "[a]ccess or interconnection provided or generally offered by a Bell operating company to other telecommunications carriers meets the requirements of this subparagraph if such access and interconnection includes each of the following:

1. Interconnection in accordance with the requirements of Sections 251(c)(2) and 252(d)(1).
2. Nondiscriminatory access to network elements in accordance with the requirements of Sections 251(c)(3) and 252(d)(1).
3. Nondiscriminatory access to the poles, ducts, conduits, and rights-of-way owned or controlled by the Bell operating company at just and reasonable rates.
4. Local loop transmission from the central office to the customer's premises, unbundled from local switching or other services.
5. Local transport from the trunk side of a wireline local exchange carrier switch unbundled from switching or other services.
6. Local switching unbundled from transport, local loop transmission, or other services.
7. Nondiscriminatory access to 911 and E911 services, directory assistance services to allow the other carrier's customers to obtain telephone numbers, and operator call completion services.
8. White pages directory listings for customers of the other carrier's telephone exchange service.
9. Until the date by which telecommunications numbering administration guidelines, plan, or rules are established, nondiscriminatory access to telephone numbers for assignment to the other carrier's telephone exchange service customers. After that date, compliance with such guidelines, plans, or rules.
10. Nondiscriminatory access to databases and signaling needed for call routing and completion.
11. Until the date by which the Commission issues regulations pursuant to Section 251 to require number portability, interim telecommunications number portability through remote call forwarding, direct inward dialing trunks, or other comparable arrangements, with as little impairment of functioning, quality, reliability, and convenience as possible. After that date, full compliance with such regulations.
12. Nondiscriminatory access to such services or information as are necessary to allow the requesting carrier to implement local dialing parity.
13. Reciprocal compensation arrangements in accordance with the requirements of Section 252.
14. Telecommunications services are available for resale in accordance with the requirements of Sections 251(c)(4) and 252(d)(3).

Appendix C: Glossary

The following terms are used in this paper. For telecommunication technology definitions, see the "Technology innovations" section of this paper. For an excellent comprehensive glossary of terms used in telecommunications regulation, see *The Twenty-One Most Frequently Asked Questions About State Telecommunications Policy*, by Thomas Bonnett [8].

Benchmark Cost Proxy Model (BCPM). A forward-looking economic cost model that attempts to provide a "real-world" view of the costs and revenues associated with providing universal service using the existing telecommunications network.

Census block groups (CBGs). A combination of census blocks, the smallest entity for which the Census Bureau collects and tabulates decennial census information; bounded on all sides by visible and invisible features shown on Census Bureau maps.

Circuit-switched protocols. Technology-based protocols which require the constant connection of a circuit to ensure transmission of information from one point to another; one message at a time can be sent using this technology.

Competing local exchange carriers (CLECs). New local exchange carriers entering local markets after the Telecommunications Act of 1996. Also called alternate local exchange carriers (ALECs).

Convergence. The merging of point-to-point telecommunications, broadband communication, and Internet technologies.

Cramming. The practice of charging for additional telecommunications services that a consumer neither ordered nor wanted.

Dual-tone multifrequency (DTMF). The type of telephone service that must be made available as part of the universal service "basic" package.

E-mail. Electronic mail, which allows users to send messages to a recipient's mailbox and which the recipient can read at a later time.

Extended area service (EAS). An extension of local telephone service beyond the "local" area, generally at rates lower than would be charged for inter-exchange service.

Federal Communications Commission. The federal agency currently responsibly for regulating interstate telecommunications. See http://www.fcc.gov for more information.

Forward-looking economic cost. A method of analyzing the cost of providing service for the purpose of calculating universal service funding and as a component of defining appropriate pricing for unbundled network elements.

Hatfield model. A forward-looking economic cost model that model provides a scalable view of telecommunications network costs using hypothetical locations of customers and a hypothetical telecommunications network model.

Incumbent local exchange carriers (ILECs). Local telephone companies, or exchange carriers, serving a particular area as of the 1996 Telecommunications Act. In many cases, ILECs are regional Bell operating companies.

Information services. Services and technologies, such as digital packet-switched networks, that include additional technology that modifies the signal in some way between the point of origin and the point of termination.

Interconnection agreements. Agreements between incumbent local exchange carriers and competing

local exchange carriers to allow the competing LEC to use the incumbent's facilities to provide local telecommunications service.

Inter-exchange carriers (IXCs). Telephone companies that provide long-distance telephone service, generally regulated by the Federal Communications Commission.

Internet II. The high-speed portions of the Internet now under development.

Internet Protocol (IP) telephony. Technology that allows consumers to make voice telephone calls over Internet connections, currently exempt from federal universal service funding requirements.

Internet Relay Chat (IRC). A technology which allows users to post short conversational messages that are visible to a group of people and who can respond instantly. Also known as "chat."

Internet Service Provider (ISP). A telecommunications company that provides a link to the Internet, typically via a dial-up connection using a modem.

Interstate Commerce Commission. The federal agency that was initially responsible for regulating telecommunications in the early 1900s.

Lifeline Program. A program that provides assistance for telephone service to low-income people.

Link Up program. A program that provides assistance with telephone installation/connection fees to low-income people.

Local area transport areas (LATAs). Territories established in 1984 in which local telephone companies are authorized to operate, under the regulations of state public utility commissions.

Local exchange carriers (LECs). Telephone companies that provide local telephone service, generally regulated by states.

Multi-user domains (MUDs). An extension of chat technologies that gives graphical representation to the people "in the chat room."

Packet-switched protocols. Technology-based protocols, or rules, which allow information sent from one point to another to be broken down into packets and then reassembled at the destination; multiple messages can coexist within the network using this technology.

Peopleware. The people who use telecommunications technology; the essential part of making the whole thing work.

Public utility commissions (PUCs). State-level commissions charged with regulating intrastate telecommunications and other services. Also called public service commissions (PSCs).

Regional Bell operating companies (RBOCs). AT&T regional operating companies providing local exchange service after the 1982 Modified Final Judgment.

Slamming. The practice of changing a consumer's long-distance provider without the consumer's express permission.

Tariffs. Prices for telecommunications services established by state public utility commissions.

Telco. Abbreviation for telephone company.

Telecommunications Act of 1996. The legislation that, among other things, opens local telephone markets to competition.

Telecommunications services. Services and technologies that are typically associated with transmitting a "clear" or unchanged signal from the point of origin to the point of termination.

Thin-client Software technology that allows computers connected via modems to simulate performance achieved by computers connected directly to a local area network.

Total Element Long Run Incremental Cost (TELRIC). The type of cost model typically used to ascertain costs for unbundled network elements (UNEs).

Unbundled network elements (UNE). As directed by the Telecommunications Act of 1996, costs and prices for individual parts of the telecommunications infrastructure that may be negotiated between incumbent local exchange carriers and competing local exchange carriers. Combining network elements for the purposes of cost comparisons is not allowed because it may result in unfair advantages to one party or the other.

Universal service. The idea that everyone should have access to telecommunications services for a reasonable charge.

Universal Service Fund (USF). A funding mechanism designed to explicitly subsidize the provision of telecommunications services for high-cost areas and low-income customers.

Videoconferencing. The use of video technologies to enable people in multiple geographical sites to see and hear one another at the same time.

Wire centers. Telephone switching locations that provide service to local loop wires connecting individual subscribers to the telecommunications network.

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